ROLLINS SCHOOL OF PUBLIC HEALTH
EMORY

DEPARTMENT:	**Global Health**
COURSE NUMBER:	**GH 529**
CREDIT HOURS:	**2**
COURSE TITLE:	**Water and Sanitation in Developing Countries**
COURSE TIME:	**THURSDAY, 8:00 – 9:50 PM**
LOCATION:	**P39 Grace Crum Rollins Building**

INSTRUCTOR NAME: Christine L. Moe

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GUEST LECTURERS:

Ned Breslin, Water for People
Rick Gelting, National Center for Environmental Health, CDC
Thomas Handzel, National Center for Environmental Health, CDC
Daniele Lantagne, National Center for Infectious Diseases, CDC
Richard Rheingans, Hubert Department of Global Health, RSPH

Recommended Textbook:

Cairncross S, Feachem R. 2003. Environmental Health Engineering in the Tropics: An Introductory Text. John Wiley & Sons. NEW AND USED COPIES AVAILABLE FROM AMAZON

Other readings will be posted on Blackboard.

Out of courtesy to all the speakers in this course, there will be **NO LAPTOP USE DURING CLASS**

COURSE DESCRIPTION (3-4 Sentences)

The course will provide students with techniques needed to develop, evaluate, and sustain successful drinking water and sanitation interventions for developing countries. It focuses on practical field and laboratory tools needed for different stages of projects, including: assessment of perceived and actual need, alternative strategies for different environmental settings, assessing cost and financial sustainability of projects, laboratory and field techniques for assessing exposure to microbial and chemical agents, and measuring health outcomes (for baseline or effectiveness assessment). The course includes lectures, case studies, and laboratory exercises.

ACADEMIC HONOR CODE
The RSPH requires that all material submitted by a student in fulfilling his or her academic course of study must be the original work of the student.

EVALUATION

Homework (30%)

Student Water/Sanitation Technology Presentations (15%)

Final Project – Intervention Proposal and Presentation (55%)

* Borderline grades will be determined based on classroom participation and in-class exercises

LEARNING OBJECTIVES OR COMPETENCIES OF THE COURSE

At the end of the course, students will be able to do the following:

- Assess community level water and sanitation use and needs based on consumption patterns, cultural norms and availability
- Identify appropriate water and sanitation interventions based on community social, economic, and environmental characteristics
- Describe the process for working with local NGOs and community members to develop local water and sanitation projects
- Develop and carry out a community water quality monitoring plan
- Conduct a process and outcomes evaluation for water and sanitation projects
- Developing a training and educational programs for water, sanitation and hygiene interventions
- Describe and evaluate alternative water policies and pricing arrangements

LEARNING OBJECTIVES OR COMPETENCIES FOR THE DEPARTMENT OR PROGRAM TO WHICH THE COURSE CONTRIBUTES

Learning Objectives for Global Health:

- Describe major transmission routes of infectious agents
- Describe and apply appropriate strategies to prevent and control infectious disease - including vaccines, antimicrobial therapy, behavior changes, and environmental interventions.
- Evaluate effectiveness of interventions to control or prevent infectious disease.
- Explain the environmental, behavioral, and evolutionary factors that contribute to the emergence and re-emergence of infectious diseases

Learning Objective for Global Environmental Health:

Exposure

- Recognize, evaluate and control environmental health hazards
- Identify environmental occupational health problems in developing countries (water, sanitation, indoor and outdoor air pollution, pesticide exposures, etc)
- Characterize and quantify exposures to microbial and chemical contaminants
- Evaluate behavioral and socio-economic factors that affect exposure levels
- Describe global and trans-boundary threats and the environmental, economic and policy factors that create them

Interventions

- Identify appropriate technologies and interventions for addressing environmental health threats in resource-limited settings
- Plan community health interventions to address environmental hazards
- Evaluate and monitor environmental health interventions

Student Technology Presentations (15% of course grade)

The beginning of each class period will be devoted to student technology presentations. Presentations will be done in groups of 2 and will be 10 minutes in length with 5 minutes for Q&A. The purpose of the presentations will be to introduce the technology (or concept) to your classmates. Each presentation should include- a general description of how the technology functions, global applications, strengths and weaknesses, potential for scaling up, sustainability issues, and why the technology is innovative. A copy of the grading criteria is available on Blackboard. The 11 presentation topics are listed below. Sign up will take place on Blackboard between January 15th and January 22nd.

1-POU chlorine treatment

2-Biosand filtration

3-Rainwater harvesting

4-Candle filters

5-Flocculation/disinfection

6-SODIS

7-Types of water pumps

8-Arbor loo

9-Constructed wetlands and pond systems

10-Microcredit (as it applies to water, sanitation, and hygiene projects)

11-Community-led Total Sanitation

Homework (30% of course grade)

There will be five homework assignments based on the readings assigned for class. They will consist of short answer questions that will be posted on Blackboard. Assignments are due at the beginning of class on the dates indicated in the syllabus. You are welcome to discuss the readings and the homework questions with your classmates.

Final Project (55% of course grade)
(Paper due May 4th; Presentations April 23rd & April 30th)

For this project you will be creating various components of either a water, sanitation, or hygiene intervention. You will work in seven different groups, with 3 to 4 students per group. Each group will address one topic with specific expectations. The seven different project topics from which to choose from are posted on Blackboard. Alternative topic ideas are welcome but must first be approved by the instructor. A sign up sheet will be passed around in class on March 19th to choose group members and topic choices. **Everyone is encouraged to begin work on this project by mid-semester.**

Each group will turn in a written report (20 single spaced pages, max) and prepare a 15-20 minute oral presentation for class. After the presentation, there will be 5-10 minutes for questions and discussion.

Each report should have the following components:

Literature review of the evidence base. Describe the evidence base and support the rationale for the type of intervention you propose. Be thorough and concise.

Implementation. Describe your intervention(s). Be specific about the technology and how you will implement it. Discuss why you think your proposal is appropriate in the community you are working in. Identify the biggest challenges you see for the interventions. Discuss some of the nitty gritty of the implementation such as- What organizations will you work with? Who will do what? Will you rely on in-country support?

Evaluation – How will you know whether your project is working and having its intended effect? Develop a logframe for your project that identifies the key activities, outputs, and impacts. Identify the key evaluation questions you will address for your project. Identify the indicators you will use to monitor whether the goals are being achieved.

Budget – You need to identify what resources will be needed to carry out your project. This should include the number and type of staff members, transportation, services, supplies, and other inputs. You do not need to put a monetary value on these resources, just identify what the resources are.

References and in-text citations are required.

Evaluation of your work

This is a group project and you are encouraged to work with your colleagues. Feel free to contact colleagues and lecturers, but be respectful of their time.

Your grade for the final project will be based on:

- Written report (60%)
- Evaluation by colleagues on your team (10%)
- Verbal presentation of the project (30%)

-Class Schedule-

Week 1 ***January 15, 2009 –*** *Distribute Syllabus, Movie: Running Dry (Klarman and Kovalchick)*

Objective Review the syllabus and introduce the topics that will be covered in the course and the expectations for the course assignments. The movie will provide an introduction to the global water and sanitation crisis.

Readings None

Week2 ***January 21, 2009 –*** *Seminar by Ned Breslin (Director, Water for People)*
12 – 1pm Room 721/9

January 22, 2009 – *Introduction to Water, Sanitation, & Health (Moe)*

Objective Provide an understanding of the magnitude of the global water and sanitation problem and its historical and current place in discussions of sustainable development; describe the exposure pathways associated with water- and sanitation-related illnesses; introduce the evidence base for the effectiveness of various types of interventions.

Readings

Required:

UNICEF, 2004. Meeting The MDG Drinking Water and Sanitation Target: A Mid-Term Assessment of Progress

Cairncross S, Feachem R. 2003. Environmental Health Engineering in the Tropics. An Introductory Text. John Wiley & Sons. (Chapt. 1)

Fewtrell L, Colford JM, 2004. Water, Sanitation And Hygiene: Interventions and Diarrhoea. A Systematic Review and Meta-analysis. Health, Nutrition and Population (HNP) Discussion Paper, World Bank.

Recommended:

Esrey SA, Potash JB, Roberts L, Shiff C. 1991. Effects of improved water supply and sanitation on ascariasis, diarrhoea, dracunculiasis, hookworm infection, schistosomiasis, and trachoma. Bull WHO 69(5):609-21.

Curtis V, Cairncross, Yonli R. 2000. Review: Domestic hygiene and diarrhoea – pinpointing the problem. TMIH 5(1)

Clasen TF, Cairncross S. 2004. Editorial: Household water management: refining the dominant paradigm. TMIH 9(2):187-91.

Gundry S, Wright J, Conroy R. 2004. A systematic review of the health outcomes related to household water quality in developing countries. J Water Health, 2(1).

Wright J, Gundry S, Conroy R. 2004. Household drinking water in developing countries: a systematic review of microbiological contamination between source and point of use. TMIH, 9(1):106-17.

Curtis V, Cairncross S. 2003. Effect of washing hands with soap on diarrhea risk in the community: a systematic review. Lancet Inf Dis 3(5)

Huttly SRA, Morris SS, Pisani V. 1997. Prevention of diarrhoea in young children in developing countries. Bull WHO 75(2):163-74.

Prüss A, Kay D, Fewtrell L, and Bartram J, 2002. Estimating the Burden of Disease from Water, Sanitation, And Hygiene At A Global Level, Environmental Health Perspectives • VOLUME 110 | NUMBER 5 | May 2002

Week 3 ***January 29, 2009 –*** *Water, Sanitation and Hygiene related Diseases (Moe)*

Homework #1 due at beginning of class.

Objective To develop a greater understanding of the various health outcomes directly and indirectly associated with poor water, sanitation, and hygiene conditions. The magnitude of these adverse health outcomes as well as the at-risk populations will be discussed.

Readings Ashbolt, N. 2004. Microbial contamination of drinking water and disease outcomes in developing regions. Toxicology 198:229-238.

Richard Carr. Excreta-related infections and the role of sanitation in the control of transmission. In: Water Quality: Guidelines, Standards and Health. L. Fewtrell and J. Bartram, eds., London: IWA Publishing, WHO, 2001. pp. 89-113.

Gundry, S., Wright, J., and Conroy, R. 2004. A systematic review of the health outcomes related to household water quality in developing countries. J Water Health, 2(1).

Student Presentation #1: [Topic]

Week 4 ***February 5, 2009 –*** *Introduction to Sanitation (Moe)*

Objective To understand the operation of different community sanitation interventions and identify where they might be most effective. Focus is on 1) developing approaches to identify the type of intervention that is most appropriate for different situations and 2) technical aspects of establishing systems. Social and technical barriers of the different systems are also included.

Readings Cairncross S. 2004. The Case for Marketing Sanitation, WSP Field Note.

Cairncross S, Feachem R. 2003. Environmental Health Engineering in the Tropics. An Introductory Text. John Wiley & Sons. (Chapt. 7-10)

Esrey, S. A. (1996). Waste, water and wellbeing: a multicountry study. American Journal of Epidemiology 143(6): 608-623

Jenkins, M. and Sugden, S. 2006. Rethinking Sanitation: Lessons and Innovation for Sustainability and Success in the New Millenium. UNDP, Human Development Report.

UNICEF, 2001. Sanitation handbook. http://www.unicef.org/wes/San_e.pdf

RECOMMENDED:

Calvert, P., Morgan, P., Rosemarim, A., Sawyer, R., and Xiao, J. 2004. Ecological Sanitation. Revised Edition. Stockholm Environment Institute.

WSP Field Note. 2004. Who Buys Latrines, Where and Why?

Jenkins, M. and Curtis, V. 2005. Achieving the 'good life': Why some people want latrines in rural Benin. Social Science and Medicine 61: 2446-2459.

Paterson, C., Mara, D., and Curtis, T. 2006. Pro-poor sanitation techonologies. Available at www.sciencedirect.com geoforum 38(2007): 901-907.

Student Presentation #2: [Topic]

Week 5 ***February 12, 2009 –*** *Assessing and Monitoring Water Quality – Microbial Contaminants (Moe)*

Homework #2 due at beginning of class.

Objective Class exercise to gain hands-on experience testing microbiological water quality using a portable water testing kit. Dr. Moe will provide urban stream water from her neighborhood. **This class period will be divided with half of the students attending the first hour and the other half attending the second hour. The student presentation will be given in between these two groups.**

Readings A handout will be provided that explains the field assignment (how to collect water samples) and the laboratory exercise (how to analyze water samples for fecal coliform bacteria by membrane filtration using the OXFAM DelAgua field kit).

Delagua Kit Manual
Student Presentation #3: [Topic]

Week 6 ***February 19, 2009 –*** *Types of Water Supplies in Developing Countries: An Engineering Perspective (Gelting)*

Objective To understand the operation of different community water interventions and identify where they might have the most impact on health. Focus is on the engineering of different systems and developing approaches to identify the type of intervention that is most appropriate for different situations. Social and technical barriers of the different systems are also included**.**

Readings Cairncross S, Feachem R. 2003. Environmental Health Engineering in the Tropics. An Introductory Text. John Wiley & Sons. (Chapt. 4-6)

Recommended:
Selections from UNICEF, 1999. Towards better programming: A water handbook**.**
Student Presentation #4: [Topic]

Week 7 ***February 26, 2009 -*** *Sanitation Implementation in Africa/Latin America (Emerson/Moe)*

Homework #3 due at beginning of class.

Objective Learn about the realities of implementing sanitation interventions in the field.

Readings Emerson, P., Cairncross, S., Bailey, R., and Mabey, D. 2000. Review of the evidence base for the 'F' and 'E' components of the SAFE strategy for trachoma control. Tropical Medicine and International Health 5(8): 515-527.

Simms, V., Makalo, P., Bailey, R., and Emerson, P. 2005. Sustainability and acceptability of latrine provision in The Gambia. The Royal Society of Tropical Medicine and Hygiene 99: 631-637.

Barreto ML, Genser B, Strina A, Teixeira MG, Assis AM, Rego RF, Teles CA, Prado MS, Matos SM, Santos DN, dos Santos LA, Cairncross S. Effect of city-wide sanitation programme on reduction in rate of childhood diarrhoea in northeast Brazil: assessment by two cohort studies. Lancet. 2007 Nov 10;370(9599):1622-8.
Student Presentation #5: [Topic]

Week 8 ***March 5, 2009 –*** *Point of Use Treatment (Lantagne)*

Readings Sobsey M, 2002. Managing water in the home: accelerated health gains from improved water supply. WHO, WHO/SDE/WSH/02.07
http://www.who.int/water_sanitation_health/dwq/wsh0207/en/print.html

Student Presentation#6: [Topic]

Week 9 ***March 12, 2009 –*** *Spring Break*

Week 10 ***March 19, 2009 -*** *Introduction to School-Based Water, Sanitation and Hygiene Interventions (Rheingans)*

Homework #4 due at beginning of class.

Objective Understand the approaches and challenges of designing and implementing school-based water, sanitation and hygiene programs. Case study on school-based water, sanitation and hygiene interventions in Kenya.

Readings Cairncross, S., and Curtis, V. 2003. Effect of washing hands with soap on diarrhea risk in the community: a systematic review. Lancet Infect Dis 3:275-281.

Luby, S., Agboatwalla, M., Painter, J., Altaf, A. Billhimer, W., Keswick, B., and Hoekstra, R. 2006. Combining drinking water treatment and hand washing for diarrhea prevention, a cluster randomized controlled trial. Tropical Medicine and International Health 11(4):479-489.

Reilly, C., Freeman, M., Ravani, M., Migele, J., Mwaki, A., Ayalo, M., Ombeki, S., Hoekstra, R., and Quick, R. 2007. The impact of a school-based safe water and hygiene programme on knowledge and practices of students and their parents: Nyanza Province, western Kenya, 2006. Epidemiol. Infect. 1-12.
Student Presentation #7: [Topic]

Final Presentation Sign-up in class

Week 11 ***March 26, 2009 -*** *Evaluation of water and sanitation projects – Introduction to process and impact evaluation of water and sanitation interventions (Rheingans)*

Objective Describe techniques for assessing the performance of water and sanitation projects. Assessment techniques include: process measures, effectiveness, and sustainability. Surveillance approaches for waterborne diseases will be discussed. Case study on developing an evaluation plan for a water and sanitation project.

Readings Moe, C (2002) "Prospective Studies of Endemic Waterborne Disease in Developing Countries" pgs. 197-206, In: Drinking Water and Infectious Disease: Establishing the Links, PR Hunter, M Waite and E Ronchi, eds. CRC Press, Boca Raton, FL.

Billig, P., Bendahmane, D., and Swindale, A. 1999. Water and Sanitation Indicators Measurement Guide. USAID. www.fantaproject.org

Student Presentation #8: [Topic]

Week 12 ***April 2, 2009 –*** *Addressing water and sanitation needs in emergency situations (Handzel)*

Objective Become familiar with the approaches and challenges of providing water and sanitation services in refugee camps and disaster settings.

Readings The Sphere Project. 2004. Humanitarian Charter and Minimum Standards in Disaster Responses. www.sphereproject.org *only Chapter 2 is required reading*

UNHCR Handbook for Emergencies (Revised sections from 2007). Chapter 14 "Water" and Chapter 15 "Sanitation and Hygiene." P. 236-283.

Student Presentation #9: [Topic]

Week 13 ***April 9, 2009 –*** *Water policy – Pricing & Equity (Rheingans)*

Homework #5 due at beginning of class.

Objective Describe alternative policy approaches to water privatization, user fees. Examine the economic challenges of funding water and sanitation improvements. Case study discussion of water pricing conflict in Bolivia.

Readings Olmstead S, 2003. Water Supply and Poor Communities: What's Price Got to Do with it?, Environment, 45(10):23-35.

Whittington D, Lauria DT, Mu X, 1991. A Study of Water Vending and Willingness to Pay for Water in Onitsha, Nigeria. World Development, 19(2/3):179-198. (Blackboard)

Assies W. 2003. David versus Goliath in Cochabamba: Water Rights, Neoliberalism, and the Revival of Social Protest in Bolivia. *Latin American Perspectives*, 30:3, pp. 14-36

Water: Time to Invest. OECD, No. 236. March 2003.

Student Presentation #10: [Topic]

Week 14 ***April 16, 2009 –*** *Movie: Thirst; Discussion –OR- Role Playing Exercise on Water Project Implementation (Gelting)*

Student Presentation #11: [Topic]

Week 15 ***April 23, 2009 –*** *Student Presentations (Groups 1, 2, 3)*

Week 16 ***April 30, 2009 –*** *Student Presentations (Groups 4, 5, 6)*